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(54) Title: DEVICE FOR REGULATING A HEATING SYSTEM, SPECIFICALLY IN A RESIDENTIAL BUILDING

(57) Abstract

    This invention describes a device for regulating a heating system, specifically for a residential building, with a heating controller (15), with an input device (17) for set temperature values related to a measured variable, preferably time and/or outdoor temperature, and with a set value memory (16) connected to the input device (17) transmitting set values, depending on the measured valuable, to the heating controller (15). To simplify set value input, it is proposed that the input device (17) consist of a display (30) for analog screen input in at least one coordinate system with preset graduation and of an evaluation circuit (31) for set temperature values entered in analog form on the display (30) via the coordinate axis (34) for the measured variable, said evaluation circuit (31) being connected at the output side of the set value memory (16)

[DIAGRAM]

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Device for Regulating a Heating System, Specifically in a Residential Building

This invention describes a device for regulating a heating system, specifically for a residential building, with a heating controller, with an input device for set temperature values related to a measurable variable – preferably time or external temperatures -- and with a set-value memory connected to an input device for transmitting set values, depending on the measured value, to the heating controller.

To control a heating system or individual heating circuits, according to a preset specified march of temperature, heating controllers are installed that compare the measured actual temperature values decisive for temperature control, e.g. outside temperature, inside temperature, flow temperature, etc., with preset values and intervene to offset any variance between preset and actual values. Specific temperatures in buildings, set for a day or a week, are usually programmed on a keyboard and set temperatures valid for selected daytimes must be entered and stored laboriously for each day of a week in prescribed sequence into a set-value memory allocated to the heating controller. This requires professional expertise. The graphic display of the stored set march of temperature via a time axis on the screen to facilitate the review of set values, has been known. However, the actual march of temperature as received by readings from temperature sensors in the heating system can be displayed on such a screen as well. After all, we are aware of the fact that to monitor a heating system, especially a solar heating system (EP 0676 682 A2), actual values perceived by temperature sensors and/or measured variables are stored in a time slot I case thresholds are exceeded prior to and after the are exceeded , in order to better assess any malfunction based on the stored temperature variables. However, while

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these well-known procedures are structured on set values, they are unable to facilitate the required comparatively laborious input of set values.

Therefore, this invention is based on the task of designing a device of the kind described in the beginning that will simplify a set-value input, even for a layman.

The invention solves this task by means of an the input device which consists of a screen for analog input in at least one coordinate axis with preset graduation and an evaluation circuit connected to the output site of the set-value memory for analog input of set temperature values on display, via the coordinate axis.

This procedure creates the possibility for analog input of a set-value process into a coordinate axis on a display screen, provided with dimensional graduation.
By means the evaluation circuit, the set values required for regulation are determined from the set-value graph entered analog and entered and stored digitally into the set-value memory. The stored set values can be retrieved to be displayed again, to make any necessary corrections by analog overwrite of the displayed set-value graph. The changed set-value course is then stored in the set-value memory by means of the evaluation circuit.

The analog input on the screen could also be performed with a mouse connected to a computer. However, it would simplify matters if the screen were to be designed with liquid crystals covered by a touch-sensitive film, because the set-value graph could be entered by hand with a pen on this type screen, known as "touch-screen".

If additional input of certain program data related to a heating system is required for a program to proceed in an orderly manner, the screen can be provided with separate input areas for such preset program data to be transmitted to the heat controller. Screen input can be simplified via certain input areas, e.g., when set-value graphs are called up via these input areas for individual heating circuits or for certain weekdays.

If the set-value memory entered through the display screen is connected to a transmission unit at a distance between the input device and the heating controller, whose receiving unit is allocated to the heating controller, the preset-value transmission for heating control can proceed from a remote location over the transmission distance in an equally simple way via an analog screen input. To transmit data from the heating controller to the screen, it is recommended to equip both heating controller and input device with transmission and receiving units to traverse the transmission distance.

Of course, the display screen provided for analog input can be used for the display of selected measured variables of the heating system, opening up a multitude of possible applications, not only for the transmission of preset values but also for monitoring the heating system with the readout of actual values.

The diagram shows a completed example of the invented device. Depicted are:

Fig. 1, a heating system with a control device in a simplified block diagram.

Fig. 2, the device according to the invention for regulating a heating system, in a block diagram, and

Fig. 3, a schematic view of an optional design of the display screen for analog input of the control device on a larger scale.

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the heating system according to Fig. 1 is designed as a warm-water heating system, having several heatint circuits 1, of which only three are depicted. The joint flow 2 and joint return 3 of these heating circuits, supplied with warm water from their joint flow 2 thru a valve 4 each, are connected by a buffer 5, via flow 7, which can be loaded by heating boiler 6. The return 8 of the heating boiler 6 is provided with a charge pump 9. However, the buffer 5 can be loaded by a solar collector 10, whose flow 11 is connected to a heat exchanger 12 of the buffer 5. The cold junction of this heat exchanger 12 is connected to the return 14 of the solar collector 10 via a pump13.

The control of this heating system, which shows only one of the performance options and can be supplemented and modified in multiple ways, proceeds via a heat controller 15, equipped with set-value memory 15. The set values needed for heat control, especially the time-related preset temperature values for individual heating circuits 1, preferably heating individual rooms, are entered into and stored in the set-value memory 16 by means of an input device 17. The actual values linked to the set values are transmitted via sensor 18 for room temperatures determined by individual heating circuits 1, via a sensor for external temperatures 19, a temperature sensor 20 for the flow temperature of heating boiler 6, a sensor 21 for solar insolation, a sensor for the flow temperature of the solar collector 10, and possibly other sensors, and transmitted to the heat controller 15, which in cases of variances intervenes as usual to offset any variance. For this purpose, the valve controls 4 are mmonitored by a valve-switching circuit 23 to control the room temperature within the range of individual heating circuits, according to set values. In compliance with the control program, control of the heat circuit pump 24 and the mixing valve 25 by which the return 3 can be connected to the flow 2 of the heating system to control the flow temperature, proceeds by heat controller 15, which also selects the heating boiler 6 and the solar collector 10. The

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control circuits 26 and 27 provided for this purpose need not be attached directly to

heating controller 15 but may be positioned near heating boiler 6 and/or the solar

collector 10, as pointed out in Fig. 1. In this case, a transmission path must be provided;

a wireless transmission path 28 appears feasible. To avoid limiting the transmission

of signals toward one direction, it is recommended that transceiver-receiver units 29 be

allocated to the heating controller 15 as well as to control circuits 26 and 27, especially if

control circuits 26 and 27 include secondary control circuits which control heating boiler

6 and/or solar collector 10, depending on actual values collected by sensors, directly

connected to control circuits 26 and 27. As an example, according to Fig. 1, this applies

to temperature sensor 20 of the flow temperature of heating boiler 6, to sensor 21 for

solar insolation, and sensor 22 for the flow temperature of the solar collector 10.

Measured variables obtained to control circuits 26 and 27 can be transmitted to heating

controller 15, to be monitored and stored.

Input device 17 for set values transmittable to heating controller 15 in Fig. 2 consists of a

screen 30 for analog input and of an evaluation circuit 31, connected to the set-value

memory 16 at the output site, determining from the analog input the set values for digital

storage, applying a method that appears feasible for the control program of heating

controller 15. The display screen 30 is built preferably from liquid crystals with a touch-

sensitive film, a so-called touch-screen, so that set values can be entered directly by

pressing down on the display screen 30 with a pen 32 (Fig. 3) or a finger. Of course, the

screen 30 may also be used to display stored set values and/or other measured variables

in analog form or as numerical values. For this purpose a control circuit 33 is provided in

Fig. 2, used to call up set values from set-value memory 16 and/or the heating controller

15, to be displayed on the screen 30. Thereby

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it is possible, for instance, to display the set and actual values, limited for control circuits 26 and 27,on the screen 30 for review.

Fig. 3 displays the input of set values on the screen in more detail. This screen 30 shows a coordinate system whose coordinate axes 34 and 35 display a dimensional graduation, firstly, for the hourly daily sequence and secondly, for the desired room temperature. Using the aforementioned pen 32, the desired march of temperature 36 above the time axis, created by the coordinate axis 34, can be entered. This preset march of temperature can be entered for each day of the week and for each heating circuit 1. For this purpose, input areas 37 for each day of the week and input areas 38 for each heating circuit 1, allocated to each of rooms 1 to 8 are provided on the screen. Thereby, via input areas 37 and 38, the march of preset temperatures can be defined independently from each other for each of the rooms 1 to 8 and for each day of the week and be entered into the set-value memory 16 through the evaluation circuit. The selected input areas 37 and 38 can be read in a display field 39. Aside from the described input areas, an input area 40 is provided – enabling input of set values for heating control during vacation periods without having to overwrite the usual weekly control. In addition, the display screen 30 can be switched via a control panel to display stored set values and/or variable actual values.

Aside from preset temperatures, on- and - off times of the heating circuit pump 24 and/or additional pumps for the purpose of maintaining the march of present temperatures, can be displayed or preset, as shown in a pump-activity diagram 41 of Fig. 3. In addition, The display can be selected in each case via an input area 42 and be switched, for example, to display actual values.

The input device 17, together with the set-value memory 16 and control switch 33, is able to form building unit 43 apart and physically separate from heating controller 15. This is shown, dotted, in Fig. 2. In this case, too, the relevant set values can be transmitted, analog, to heating controller 15 over a distance, by entering the set-value graphs on the screen 30. For this purpose, building unit 43, like heating controller 15, must be equipped with an appropriate transceiver-receiver unit 29, to transmit over a distance.

This invention is, of course, not limited to the presented example. Thus, the control device can be utilized not only for heating but also for the cooling of rooms. In this case, heat has to be removed from the rooms via heating circuits 1. For example, the necessary cooling of the heat transfer medium can proceed via a heat pump. Set values for room temperatures can be entered in analog form.
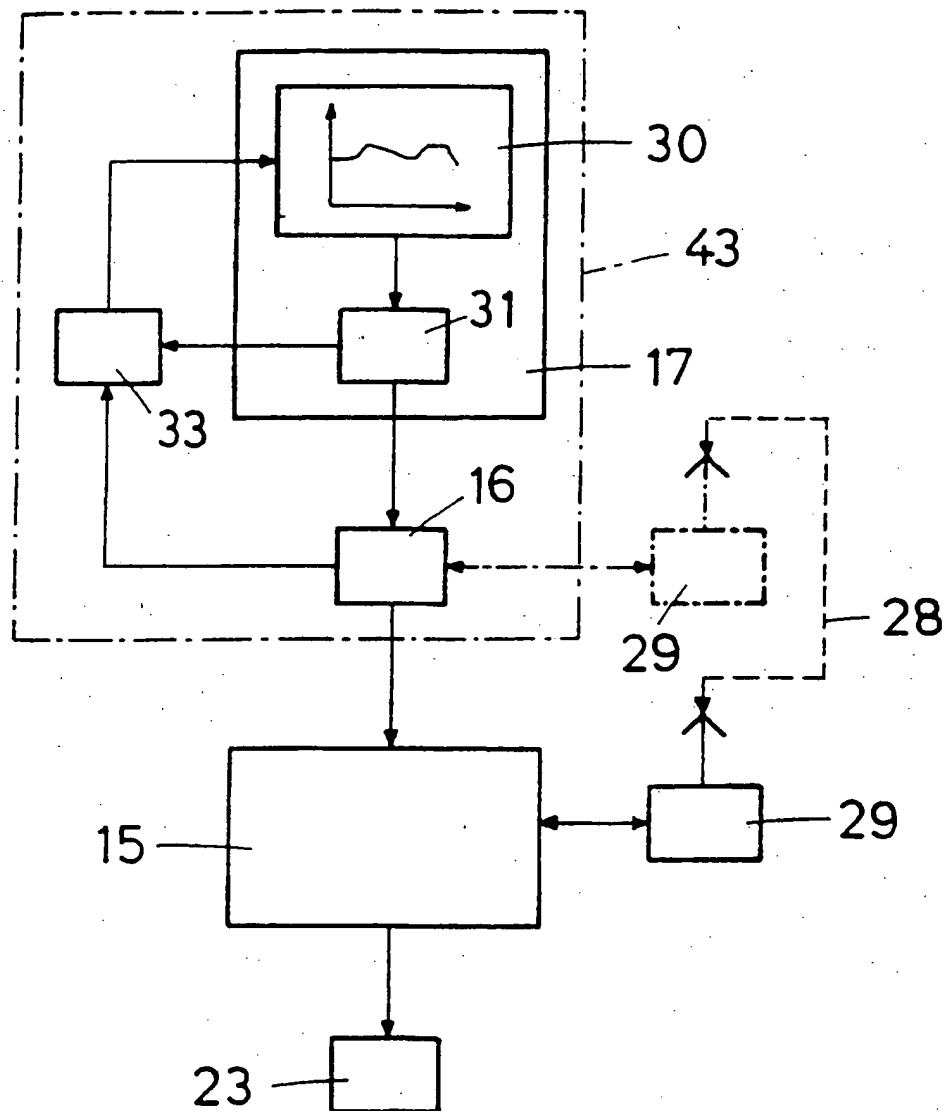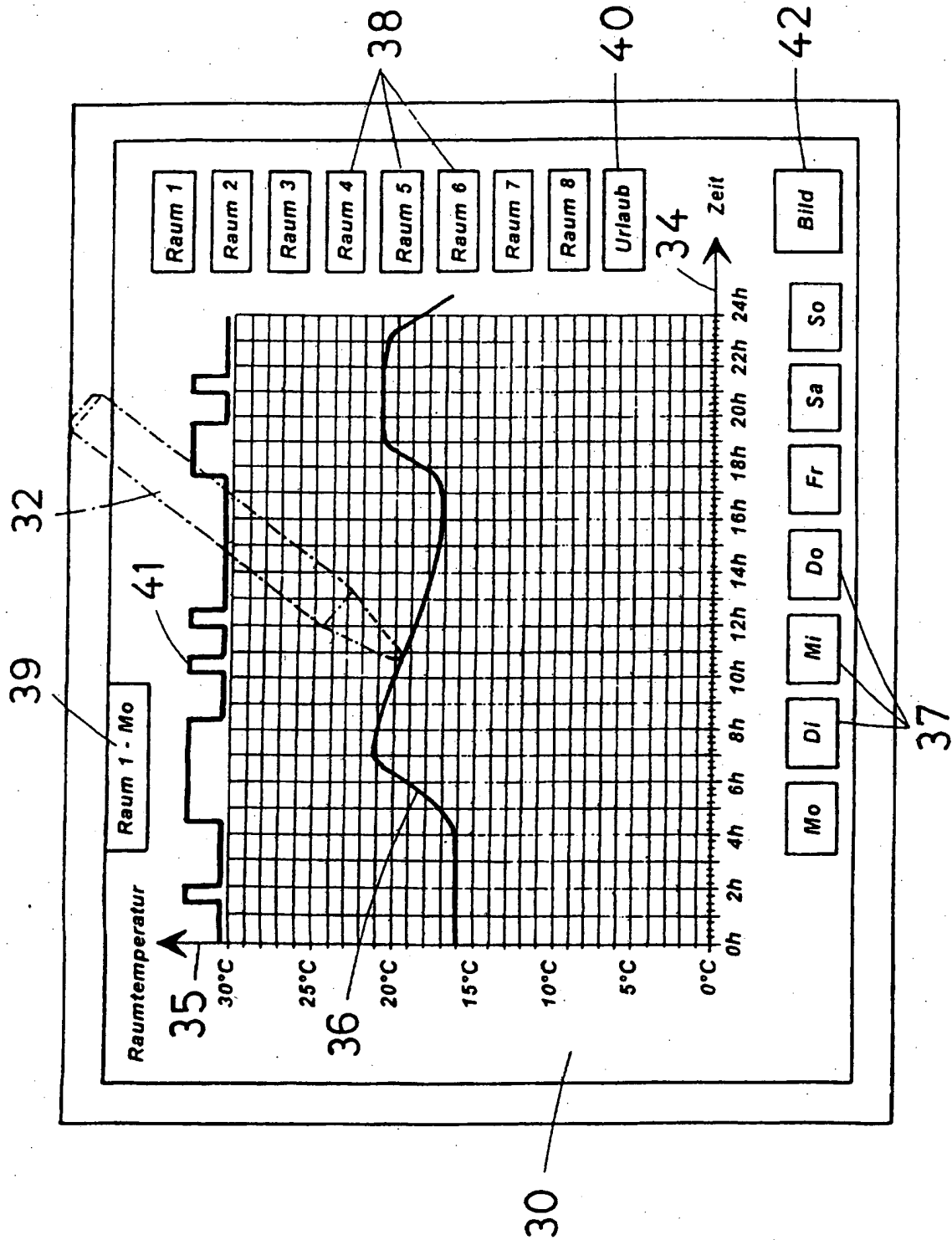
FIG.1
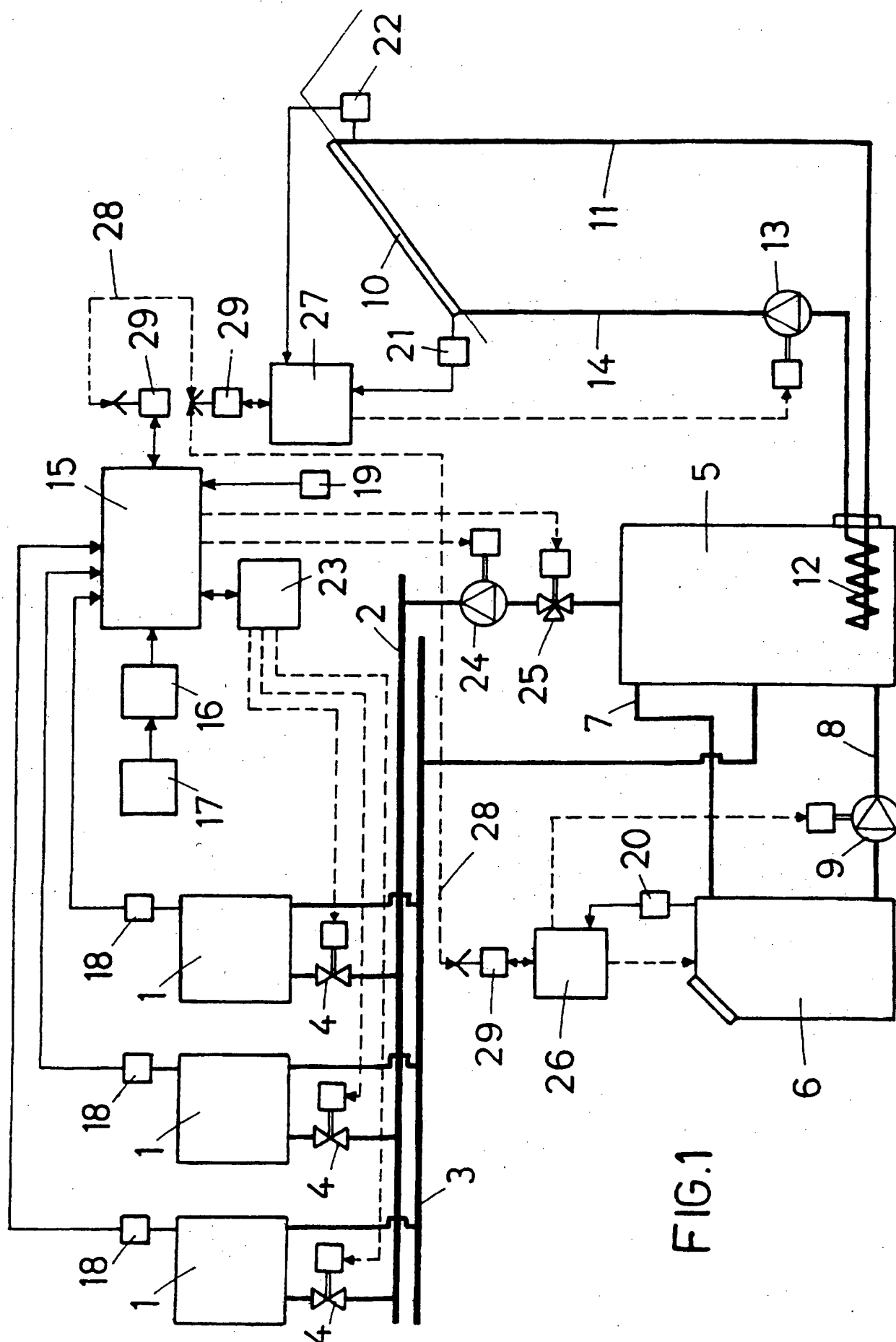
FIG.2

FIG.3

Fig.3

Legend: Item 35 – room temperature
            Item 39 – Room 1 – Monday
            Item 37 – Days of the week (Tuesday – Sunday)
            Item 38 – Room 1 thru 8
            Item 40 -- Vacation

Three pp. (fax pp. 034 thru 036) re PCT/AT/00071 contain a document titled,
"International Search Report" previously translated from the German-language
version contained in the subsequent three pages.